

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended). A transmission ~~Transmission method,~~ for transmitting
a plurality of symbols comprising:

transmitting a plurality of symbols from a base station of a MC-CDMA
telecommunication system to a plurality (K) of users, said base station including a plurality
(M) of antenna elements;

spreading each symbol (d_k) to be transmitted to a user the plurality of users being
~~spread~~ with a coding sequence ($c_k(l)$) over a plurality (L) of carriers (l) to produce a plurality
of corresponding frequency components; and, ~~said base station being provided with a~~
~~plurality (M) of antenna elements,~~

weighting, at the base station, ~~characterised in that~~ each frequency component
produced by a symbol of a user (k) ~~is weighted~~ by a plurality (M) of weighting complex
coefficients ($w_k^*(l,m)$, $m=1, \dots, M$) to obtain a plurality (LM) of weighted frequency
components ($z_k^m(l)$), each weighting coefficient being relative to a user (k), a carrier (l) and
an antenna element (m), ~~and~~ said plurality of weighting coefficients being determined from
estimates of the channel coefficients ($h_k(l,m)$) of the downlink transmission channels between
each antenna element and each user for each carrier frequency.

Claim 2 (Currently Amended): ~~Transmission~~ The transmission method according to
claim 1, ~~characterised in that,~~ further comprising:

adding up per carrier, for each antenna element (m), the weighted frequency
components relative to said antenna element and to the ~~different~~ plurality of users; ~~are added~~
~~up per carrier to output~~

outputting a plurality (L) of compound frequency components $\left(\sum_{k=1}^k z_{kz}^m(\ell), \ell = 1, \dots, L \right)$;

and $[[,]]$

inverse Fourier transforming said plurality of compound frequency components ~~being~~
~~further subjected to an inverse Fourier transform~~ to generate a signal ($S^m(t)$) to be transmitted
by said antenna element.

Claim 3 (Currently Amended): ~~Transmission~~ The transmission method according to
~~claim claims 1 or 2, characterised in that~~ wherein said estimates of the channel coefficients
are obtained as estimates of the channel coefficients of ~~the~~ uplink transmission channels
between each user and each antenna element for each carrier frequency.

Claim 4 (Currently Amended): ~~Transmission~~ The transmission method according to
claim 3, ~~characterised in that~~ further comprising:

obtaining the weighting coefficients relative to a given user ~~are obtained~~ as a function
of ~~the~~ coding sequences of all said users, said estimates of channel coefficients, ~~the~~ transmit
powers (P_{t_k}) used for respectively transmitting said symbols to the different users, a variance
of noise (σ^2) affecting the received frequency components at the user side and ~~equalising~~
equalizing coefficients applied ~~thereto~~ to the weighting coefficients.

Claim 5 (Currently Amended): ~~Transmission method according to claim 4~~
~~characterised in that~~ A transmission method, comprising:

transmitting a plurality of symbols from a base station of a MC-CDMA
telecommunication system to a plurality (K) of users, said base station including a plurality
(M) of antenna elements;

spreading each symbol (d_k) to be transmitted to the plurality of users with a coding sequence ($c_k(l)$) over a plurality (L) of carriers (l) to produce a plurality of corresponding frequency components; and

weighting each frequency component produced by a symbol of a user (k) by a plurality (M) of weighting complex coefficients ($w_k^*(l,m), m=1, \dots, M$) to obtain a plurality (LM) of weighted frequency components ($z_k^m(l)$), each weighting coefficient being relative to a user (k), a carrier (l) and an antenna element (m), said plurality of weighting coefficients being determined from estimates of channel coefficients ($h_k(l,m)$) of downlink transmission channels between each antenna element and each user for each carrier frequency,

wherein said estimates of the channel coefficients are obtained as estimates of the channel coefficients of uplink transmission channels between each user and each antenna element for each carrier frequency;

obtaining the weighting coefficients relative to a given user as a function of coding sequences of all said users, said estimates of channel coefficients, transmit powers (P_{t_k}) used for respectively transmitting said symbols to the different users, a variance of noise (σ^2) affecting received frequency components at a user side and equalizing coefficients applied to the weighting coefficients, wherein

the weighting coefficients relative to a given user g are determined from the elements of a vector w_g , where $[[.*]]^*$ denotes the conjugate operation and where w_g is determined according to an expression of the type:

$$w_g = \mu_g (\hat{\Phi}_g + \sigma^2 \cdot I_{ML})^{-1} (\tilde{c}_g \circ \tilde{q}_g \circ \hat{h}_g \circ \tilde{c}_g)$$

$$w_g = \mu_g (\hat{\Phi}_g + \sigma^2 \cdot I_{ML})^{-1} (\tilde{c}_g \circ \tilde{q}_g \circ \hat{h}_g \circ \tilde{c}_g)$$

where, M and L being are respectively the a number of the antenna elements and the a number of the carriers;

\tilde{c}_g is a vector of size ~~$M \cdot L$~~ $M \cdot L$ defined as the a concatenation of M times the a vector $c_g = (c_g(1), \dots, c_g(L))^T$ representing the a coding sequence of said given user g ;

\tilde{q}_g is a vector of size ~~$M \cdot L$~~ $M \cdot L$ defined as the concatenation of M times the a vector $q_g = (q_g(1), \dots, q_g(L))^T$ representing the ~~equalising~~ equalizing coefficients for said given user g ;

\hat{h}_g is a vector of size ~~$M \cdot L$~~ $M \cdot L$, the first L elements of which represent the ~~said~~ estimates of the a channel between antenna element 1 and user g , the second L elements of which ~~corresponding~~ correspond to the estimates of a channel between antenna element 2 and user g and so on;

μ_g is a scalar coefficient given by the a constraint upon the a transmit power for user g ;

I_{ML} is the an identity matrix of size ~~$M \cdot L \times M \cdot L$~~ $M \cdot L \times M \cdot L$;

σ^2 is the a value of said noise variance;

$\hat{\Phi}_g$ is a hermitian matrix characterising the multiple access interference generated by the user g on the other users; and

where \odot denotes the element by element multiplication of two vectors.

Claim 6 (Currently Amended): ~~Transmission~~ The transmission method according to claim 5, wherein ~~characterised in that~~ said hermitian matrix is obtained from an expression of the type:

$$\hat{\Phi}_g = \sum_{k \neq g}^k P t_k \cdot \hat{v}_{kg} \hat{v}_{kg}^H$$

$$\hat{\Phi}_g = \sum_{k \neq g}^k P t_k \odot \hat{v}_{kg} \hat{v}_{kg}^H$$

where K is number of users, P_{t_k} is the transmit power for user k and

$$\hat{v}_{kg} = \tilde{c}_k^* \circ \tilde{q}_k \circ \hat{h}_k \circ \tilde{c}_g$$

where \tilde{c}_k is a vector of size $M \cdot L$ defined as the concatenation of M times the vector $c_k = (c_k(1), \dots, c_k(L))^T$ representing the coding sequence of user k ;

\tilde{q}_k is a vector of size $M \cdot L$ defined as the concatenation of M times the vector $q_k = (q_k(1), \dots, q_k(L))^T$ representing the equalizing coefficients for user k , and

\hat{h}_k is a vector of size $M \cdot L$, the first L elements of which represent the estimates of the channel between antenna element 1 and user k , the second L elements of which correspond to the estimates of a channel between antenna element 2 and user k and so on.

Claim 7 (Currently Amended): ~~Transmission method according to claim 4 characterised in that~~ A transmission method, comprising:

transmitting a plurality of symbols from a base station of a MC-CDMA telecommunication system to a plurality (K) of users, said base station including a plurality (M) of antenna elements;

spreading each symbol (d_k) to be transmitted to the plurality of users with a coding sequence ($c_k(l)$) over a plurality (L) of carriers (l) to produce a plurality of corresponding frequency components; and

weighting each frequency component produced by a symbol of a user (k) by a plurality (M) of weighting complex coefficients ($w_k^*(l,m)$, $m=1, \dots, M$) to obtain a plurality (LM) of weighted frequency components ($z_k^m(l)$), each weighting coefficient being relative to a user (k), a carrier (l) and an antenna element (m), said plurality of weighting coefficients

being determined from estimates of channel coefficients ($h_k(l,m)$) of downlink transmission channels between each antenna element and each user for each carrier frequency,

wherein said estimates of the channel coefficients are obtained as estimates of the channel coefficients of uplink transmission channels between each user and each antenna element for each carrier frequency;

obtaining the weighting coefficients relative to a given user as a function of coding sequences of all said users, said estimates of channel coefficients, transmit powers (P_{t_k}) used for respectively transmitting said symbols to the different users, a variance of noise (σ^2) affecting received frequency components at a user side and equalizing coefficients applied to the weighting coefficients, wherein

the weighting coefficients relative to a given user g are determined from the elements of a vector w_g^* where $[[.*]]^*$ denotes the a conjugate operation and where w_g is determined according to an expression of the type:

$$w_g = \mu_g \left(\hat{\Phi}_g + \sigma^2 \cdot I_{ML} \right)^{-1} (\tilde{c}_g \circ \hat{h}_g \circ \tilde{c}_g)$$

where, M and L ~~being~~ are respectively ~~the~~ a number of the antenna elements and ~~the~~ a number of the carriers;

\tilde{c}_g is a vector of size ~~$M \cdot L$~~ $M \cdot L$ defined as ~~the~~ a concatenation of M times ~~the~~ a vector $c_g(c_g(1), \dots, c_g(L))^T$ representing ~~the~~ a coding sequence of said given user g ;

\hat{h}_g is a vector of size ~~$M \cdot L$~~ $M \cdot L$, ~~the~~ the first L elements of which represent ~~the said~~ estimates of ~~the~~ a channel between antenna element 1 and user g , ~~the~~ the second L elements of which ~~corresponding~~ correspond to ~~the~~ the estimates of a channel between antenna element 2 and user g and so on;

μ_g is a scalar coefficient given by ~~the~~ a constraint upon ~~the~~ a transmit power for user g ;

I_{ML} is the an identity matrix of size $M \cdot L \times M \cdot L$;

σ^2 is the a value of said noise variance;

$\hat{\Phi}_g$ is a hermitian matrix ~~characterising the~~ characterizing a multiple access interference generated by user g on ~~the~~ other users; and

~~where~~ \odot denotes the element by element multiplication of two vectors.

Claim 8 (Original): ~~Transmission method according to claim 4 characterised in that~~

A transmission method, comprising:

transmitting a plurality of symbols from a base station of a MC-CDMA

telecommunication system to a plurality (K) of users, said base station including a plurality (M) of antenna elements;

spreading each symbol (d_k) to be transmitted to the plurality of users with a coding sequence ($c_k(l)$) over a plurality (L) of carriers (l) to produce a plurality of corresponding frequency components; and

weighting each frequency component produced by a symbol of a user (k) by a plurality (M) of weighting complex coefficients ($w_k^*(l,m)$, $m=1, \dots, M$) to obtain a plurality (LM) of weighted frequency components ($z_k^m(l)$), each weighting coefficient being relative to a user (k), a carrier (l) and an antenna element (m), said plurality of weighting coefficients being determined from estimates of channel coefficients ($h_k(l,m)$) of downlink transmission channels between each antenna element and each user for each carrier frequency,

wherein said estimates of the channel coefficients are obtained as estimates of the channel coefficients of uplink transmission channels between each user and each antenna element for each carrier frequency;

obtaining the weighting coefficients relative to a given user as a function of coding sequences of all said users, said estimates of channel coefficients, transmit powers (P_{t_k}) used

for respectively transmitting said symbols to the different users, a variance of noise (σ^2) affecting received frequency components at a user side and equalizing coefficients applied to the weighting coefficients, wherein

the weighting coefficients relative to a given user g are determined from the elements of a vector w_g^* where $[[.*]]$ * denotes the a conjugate operation and where w_g is determined according to an expression of the type:

$$w_g = \mu_g (\hat{\Phi}_g + \sigma^2 \cdot I_{ML})^{-1} \hat{h}_g$$

$$w_g = \mu_g (\hat{\Phi}_g + \sigma^2 \cdot I_{ML})^{-1} \hat{h}_g$$

where, M and L ~~being~~ are respectively ~~the~~ a number of the antenna elements and ~~the~~ a number of the carriers;

\hat{h}_g is a vector of size ~~$M \cdot L$~~ $M \cdot L$, the first L elements of which represent ~~the said~~ estimates of ~~the~~ a channel between antenna element 1 and user g , the second L elements of which corresponding to ~~the~~ estimates of a channel between antenna element 2 and user g and so on;

μ_g is a scalar coefficient given by ~~the~~ a constraint upon ~~the~~ a transmit power for user g ;

I_{ML} is ~~the~~ an identity matrix of size ~~$M \cdot L \times M \cdot L$~~ $M \cdot L \times M \cdot L$;

σ^2 is ~~the~~ a value of said noise variance; and

$\hat{\Phi}_g$ is a hermitian matrix ~~characterising the~~ characterizing multiple access interference generated by user g on ~~the~~ other users.

Claim 9 (Currently Amended): ~~Transmission~~ The transmission method according to ~~claim~~ claims 7 or 8, ~~characterised in that~~ wherein said hermitian matrix is obtained from an expression of ~~the type~~:

$$\hat{\Phi}_g = \sum_{k \neq g}^k P t_k \cdot \hat{v}_{kg} \hat{v}_{kg}^H$$

$$\hat{\Phi}_g = \sum_{k \neq g}^k P t_k \bullet \hat{v}_{kg} \hat{v}_{kg}^H$$

where K is number of users, $P t_k$ is the a transmit power for user k and

$$\hat{v}_{kg} = \tilde{c}_k^* \circ \hat{h}_k \circ \tilde{c}_g$$

where \tilde{c}_k is a vector of size ~~$M \cdot L$~~ $M \cdot L$ defined as the a concatenation of M times the a vector $c_k = (c_k(1), \dots, c_k(L))^T$ representing the a coding sequence of user k ,

\tilde{c}_g is a vector of size ~~$M \cdot L$~~ $M \cdot L$ defined as the a concatenation of M times the a vector $c_g = (c_g(1), \dots, c_g(L))^T$ representing the a coding sequence of said given user g ;

\hat{h}_k is a vector of size ~~$M \cdot L$~~ $M \cdot L$, the first L elements of which represent the said estimates of the a channel between antenna element 1 and user k , the second L elements of which ~~corresponding~~ correspond to the estimates of a channel between antenna element 2 and user k and so on; and

where \circ denotes the element by element multiplication of two vectors.